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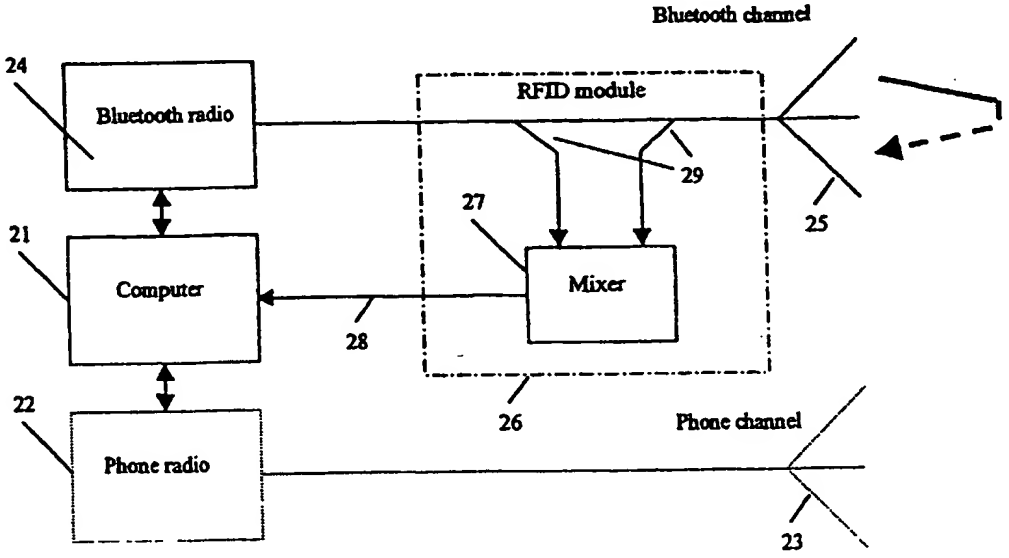
(54) Title: PORTABLE COMMUNICATIONS UNIT



(57) Abstract: A system that includes a mobile communications unit, wherein an identification module is added between radio part and antenna in a mobile telephone that includes a Bluetooth function, and wherein the module comprises a mixer for transposing identification messages from identification devices in a 2.45 GHz RFID system of the backscatter type to a baseband for further processing in the computer part of the unit and possibly communication with a superordinate system via standard call channel or Bluetooth channel. In one particular embodiment, the unit is also able to send information to said identification devices for alerting and/or transmitting data, wherein modulation and encoding can be effected in accordance with the Bluetooth standard, therewith enabling said mixer to be included as an integral part of a standard Bluetooth radio.

WO 01/39103 A1

PORTABLE COMMUNICATIONS UNIT

BACKGROUND OF THE INVENTION AND ITS MOST SIGNIFICANT CHARACTERISTIC FEATURES

Automatic identification systems using radio/microwaves (RFID = Radio Frequency Identification) are characterised by identification devices (also designated ID tags, data carriers, cards, transponders, etc.) attached to the object to be identified and read from a remote location with the aid of a reader. The objects often pass in an ordered stream or flow, such as chassis and their manufacture in a car manufacturing plant, containers in different distribution systems, cars that have access to garages and restricted areas, people passing through highly frequented doors and passage gates, trucks in distribution centres, ports, airports and the like, railway traffic along a railroad track, and so on.

A range of several metres is achieved with microwave based systems, which often operate in the bands of 915 MHz, 2.45 GHz and 5.8 GHz, which is particularly suitable for the aforementioned relatively large objects. In this regard, stationary reading units are placed adjacent the locations in which the objects are expected to pass, so that identification can be effected fully automatically.

One problem, however, is that the objects do not always move in a steady stream or flow, but are parked, stopped, or take routes other than those expected. Consequently, it is desirable to obtain a compact and portable reading unit that can be readily placed in the vicinity of the object to be identified, e.g. a load carrier that awaits further transportation.

Further transportation to superordinate systems also represents a problem. A portable unit cannot, after all, simply be connected via a cable for the transfer of data from the ID devices. Similarly, if the ID device is of a programmable type, very simple transmission of data from superordinate systems to the portable unit and from there to the data carrier is desired.

Patent Application WO 93/16351 A1 provides a solution to these problems. Although this unit is portable and solves the aforesaid problems, its practical design is particularly expensive to produce. This is because the market requirement of portable units constitutes

only a hundredth of the requirement for stationary units. Such units are also relatively clumsy, because the small series in which they are produced do not permit a sufficiently high integration level, i.e. discrete components are used instead of ASIC:s, standard designs must be used with regard to casings, displays, keybanks, etc and the functionality of such units is also restricted, because of the lack of standards for the wireless communication with superordinate systems.

The present invention solves the aforesaid problems relating to costs, dimensions and standardisation, by utilising the so called Bluetooth technology created in the mobile telephony industry and operating at 2.45 GHz. A Bluetooth telephone is supplemented with an identification module between radio part and antenna and can therewith communicate with 2.45 GHz identification devices in a known manner.

The communication with superordinate systems is also effected with Bluetooth, should the portable unit be located within the range covered by a Bluetooth network. Such a network will normally have a range of 10-100 metres.

Alternatively, when the portable unit is not located in a Bluetooth network, said unit, which also is a mobile telephone, may be able to transmit and receive digital messages concerning identification devices via so called SMS messages with respect to a mobile telephone system according to GSM standards, alternatively according to some other standard for transmitting digital messages. This latter alternative includes all types of mobile telephone systems that can transmit digital data messages.

The Bluetooth module of the mobile telephone is supplemented with a baseband mixer for RFID between transmitter and antenna. The mixer output signal is amplified and encoded traditionally in a microprocessor and the data is stored intermediately and sent to a superordinate system as SMS messages or the like. Corresponding writing of the data is effected by pulsating the microwave signal.

The telephone is already compact, contains few components and already has an infrastructure for communicating information with superordinate systems.

BRIEF DESCRIPTION OF THE DRAWING

The invention will now be described with reference to an exemplifying embodiment thereof and also with reference to the accompanying drawing, in which

Fig. 1 illustrates an RFID system of the so-called backscatter type; and

Fig. 2 shows an RFID system integrated in a mobile telephone.

DESCRIPTION OF THE INVENTION

Figure 1 illustrates a read unit 1 and an identification device 2 that interconnect via a microwave signal 3. The read unit includes a microwave oscillator 4 which irradiates the antenna 14 of the identification device via the antenna 5. The electronic unit 7 of the identification device receives, encodes, modulates and reflects the signal from the read unit with information according to the data present in the electronic unit of the identification device and therewith creates so-called identification messages 8 that are sent to the read unit.

The data content of these messages may be pre-programmed in the identification device or may be programmable, e.g., via microwaves through the medium of contact devices (not shown) or in some other way. When programming is effected via microwaves, the output signal of the microwave oscillator 4 is amplitude modulated/pulsated in accordance with the data to be transferred to the identification device 2.

The identification messages 8 are delivered to a receiver antenna 6 in the read unit. However, the receiver antenna need not necessarily be separate from the transmitter antenna 5, as in the case illustrated for the sake of simplicity, but may be incorporated in a unit that operates, e.g., in opposite polarisations, such as right/left polarisation or horizontal/vertical polarisation.

The microwave signal received from the identification device is transposed in a mixer 9 in the read unit 1 from the antenna 6 to a baseband, by mixing the signal with part of the signal sent by the antenna 5, so as to recreate the identification messages 8 and deliver said messages to the computer part or processor 10 of the read unit.

Data and other information contained in the identification device can therewith be made available via the communications channel 13, for instance by serial communication in accordance with some traditional method, or wireless.

Only an RFID system has been shown in the illustrated embodiment, where a non-modulated microwave signal is sent from the read unit, as may be the case when the identification device includes a constantly oscillating circuit for clocking its internal logic and its modulation circuits connected to the antenna of said identification device.

According to another embodiment, the read unit may also be used to activate the identification device, e.g. by sending pulsed microwave signals that are detected by circuits in the identification device and therewith, e.g., initiate a device-incorporated oscillator for forward clocking of data to modulator circuits in connection with the antenna of said device.

According to another embodiment, the read unit can send pulsed microwave signals for transferring data to the identification device for storage in a memory incorporated in said device and/or for controlling the function of said device. Consequently, the read unit is sometimes also called a write/read unit.

Figure 2 illustrates a write/read unit of an RFID system of the backscatter type integrated with a telephone that includes a Bluetooth channel.

The mobile telephone, which may be a GSM telephone, includes a computer part 21 which controls and co-acts with the radio part used for the conventional function of the mobile telephone, i.e. communicates with the base station via the antenna 23 over a relatively large range (typically up to some kilometres), e.g. when the telephone is mounted in a vehicle, or within a building that lacks a separate basestation, etc. A frequency in the order of 0.9 GHz or 1.8 GHz is often used for this communication.

Many mobile telephone operators provide services for data transmission via said links, i.e. the antenna 23 is used, for instance, to send text messages that are put through from the telephone keypad or an external PC via the computer part 21. A common service of this kind is designated SMS and the messages are referred to as SMS messages. The antenna

23 can also be used to receive text messages, e.g. for presentation in the character window of the mobile telephone or for forwarding the messages to an external PC.

Figure 2 also shows a Bluetooth channel where a further radio part 24 is mounted for communication with external units via the antenna 25 at relatively short ranges (typically up to 100 metres). According to Bluetooth, such a supplementary channel transmits typically in the range of 2400-2480 MHz and thus overlaps the frequency band of 2450 MHz permitted for RFID and typically smaller than a bandwidth of 30 MHz. The Bluetooth radio 24 transmits at a low power output, only some milliwatts, and is thus relatively inexpensive. The cost involved is particularly low because mobile telephones are produced in very large numbers and therefore defend a high integration level. i.e. a large part of the radio 24 is integrated in one or a few ASICs (Application Specific Integrated Circuits).

Thus, the Bluetooth radio 24 can be used, e.g., for communication with another Bluetooth radio which, however, need not necessarily be integrated in a mobile telephone. It may equally as well be integrated in a PC for the transmission of data files, or in a telephone jack for calls via the standard and line-bound telephone network.

According to this embodiment of the invention, an RFID module 26 has been included in the mobile telephone and utilises the same radio part 24 and antenna 25 as the Bluetooth function of the mobile telephone. The addition is extremely simple and consists solely in the inclusion of a mixer 27 between the radio part 24 and the antenna 25. The information carrying signal from the identification device is tapped-off at the junction point 29 and mixed with the transmitter signal tapped-off at the junction point 28 so as to obtain a baseband signal with identification messages obtained at 28. These messages are passed to the data part 21 of the mobile telephone and there processed in an appropriate manner. Functions for the units 10, 4, 5 and 6 in Figure 1 are already found in the mobile telephone and the only hardware added for the RFID function is the mixer 9, i.e. the unit 27 in Figure 2. This results in a particularly compact, useful and inexpensive mobile read unit in accordance with the invention.

If data needs to be transferred to the identification device and/or if the device requires an amplitude-modulated alert signal at 2.45 GHz, this can also be achieved. The signal from

the Bluetooth radio, which already includes amplitude-modulated circuits, is then pulsated in accordance with an appropriate pattern so as to be able to write data into the device.

In one preferred embodiment of the invention, the mixer 27 is included in the standard circuits of the Bluetooth radio 24 as an integrated unit, and the portable communications unit is adapted to read identification devices that deliver a backscatter signal according to the Bluetooth standard.

The invention also relates to an identification device that delivers its information modulated and encoded to liken the messages that are normally transmitted between different Bluetooth units, i.e. units with transmitters at both ends of the transmission link. Such an identification device is constructed for the high transmission rates in the microwave channel for which Bluetooth has been specified, as compared with the majority of RFID systems, and therefore enables power consumption to be reduced and therewith also the need for large batteries in said device. The identification device is also able to operate at a high data rate although it is also able to take a power-lean rest position between communication occasions, by virtue of having an alert facility.

The identification device may therewith also be adapted for writing in accordance with the Bluetooth standard.

CLAIMS

1. A portable communications unit for reading and/or writing of data from and into identification devices with the aid of microwaves at 2.45 GHz, wherein the communications unit irradiates said device with said microwaves, and wherein the identification device reflects its information to the communications unit by modulation of the incident microwave signal, without supplying further energy to said unit, **characterised** in that the communications unit is comprised of a mobile telephone which is provided with 2.45 GHz Bluetooth technology and which is supplemented with a baseband mixer (27) between the radio part of the Bluetooth channel and antenna, and which is adapted for receiving identification messages from said identification device.

2. A portable communications unit according to Claim 1, **characterised** in that the mixer output signal is amplified and encoded in a traditional manner in a computer part (21) in the mobile telephone.

3. A portable communications unit according to any one of the preceding Claims, **characterised** in that data is stored intermediately and sent to a superordinate system as SMS messages or the like via a standard mobile telephone speech channel.

4. A portable communications unit according to any one of the preceding Claims, **characterised** in that data is stored intermediately and sent to a superordinate system as data messages or the like via the Bluetooth channel of the mobile telephone.

5. A portable communications unit according to any one of the preceding Claims, **characterised** in that identification devices that include an alert facility can be alerted by amplitude modulation/pulsating of the microwave signal sent from the Bluetooth radio (24).

6. A portable communications unit according to any one of the preceding Claims, **characterised** in that new data can be written into identification devices that include a write function via the Bluetooth radio (24) by amplitude modulation/pulsation of the transmitted microwave signal.

7. A portable communications unit according to any one of the preceding Claims, **characterised** in that the identification device is adapted to respond to the messages in the Bluetooth channel, by modulation in accordance with the Bluetooth standard; and in that said mixer (27) is included in the standard receiver circuit of the Bluetooth radio (24) as an integrated unit.

8 A portable communications unit according to any one of the preceding Claims, **characterised** in that said unit also includes an identification device which delivers its information modulated and encoded in accordance with the Bluetooth standard.

9. A portable communications unit according to any one of the preceding Claims, **characterised** in that the identification device can operate at a high data rate and therewith be Bluetooth compatible, although it is also able to adopt a power-lean rest position between communication occasions between times, by virtue of having an alert facility.

10. A portable communications unit according to any one of the preceding Claims, **characterised** in that the identification device is also adapted to allow data to be written thereinto in accordance with the Bluetooth standard.

1/1

Figurer

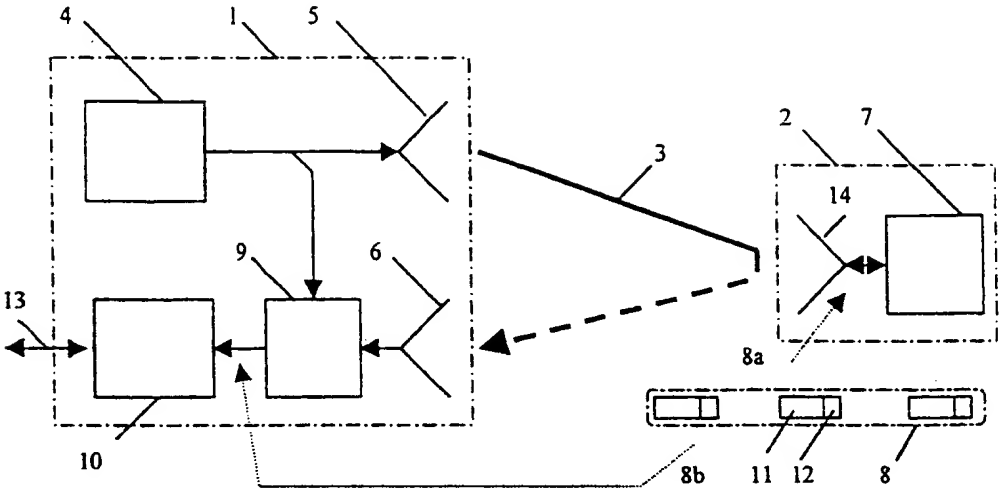


Fig 1

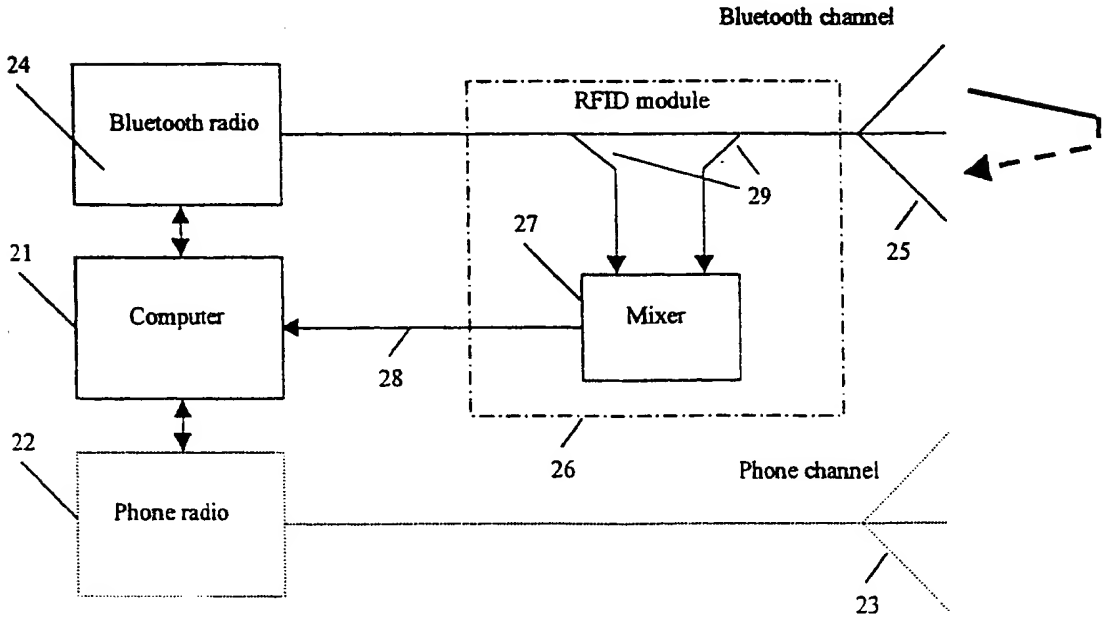


Fig 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/02375

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06K 7/10, G01S 13/76, G07C 9/00, B61L 25/04
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B61L, G01S, G06K, G07C, H04B, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9816070 A1 (AMTECH CORPORATION), 16 April 1998 (16.04.98), figure 3, abstract ---	1-10
A	WO 9316531 A1 (SAAB-SCANIA COMBITECH AKTIEBOLAG), 19 August 1993 (19.08.93), abstract ---	1-10
A	US 5008661 A (PHANI K. RAJ), 16 April 1991 (16.04.91), abstract --- --------	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
16 February 2001	08 -03- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Göran Magnusson /OGU Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

27/12/00

International application No.
PCT/SE 00/02375

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO 9316531 A1	19/08/93	AT 196093 T	15/09/00
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